

# NASA TECH BRIEF



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## Modification Increases Light Output of Injection-Luminescent Diodes

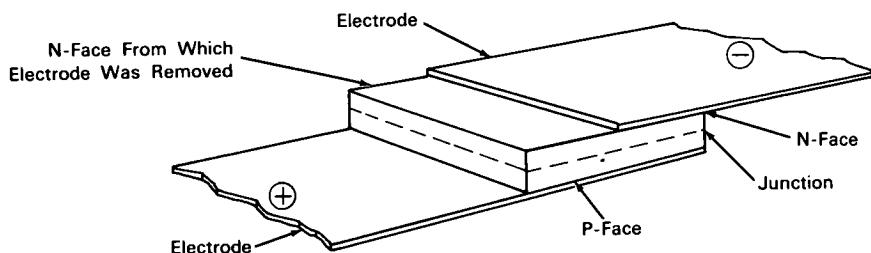


FIGURE 1

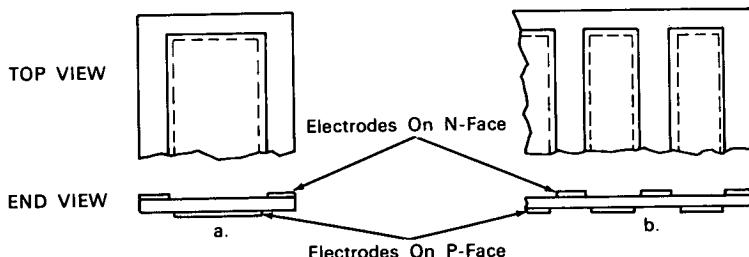


FIGURE 2

**The problem:** Increasing the incoherent light output from injection-luminescent diodes for pumping lasers.

**The solution:** Removing part of the electrode area from the n-face of the diodes. As a result of this removal, a substantial increase (approximately 50%) in light output is obtained, because light is emitted from the n-face as well as from the four edges of the diode (in an approximately hemispherical distribution).

**How it's done:** In one arrangement, Figure 1, the negative electrode extends over approximately half of

the n-face of the diode leaving the other portion clear to radiate. The p-face on the opposite side of the diode is completely covered by the positive electrode. In order to remove the electrode material from the n-face, the diode is first covered with masking lacquer except over the portion of the electrode to be removed. The diode is then treated with aqua regia (a 1:1 mixture of concentrated hydrochloric and nitric acids) to etch away the uncovered portion of the electrode on the n-face. After etching is completed, the diode is washed with water and the masking lacquer is removed by an organic solvent.

(continued overleaf)

Somewhat more complicated arrangements are suggested in Figure 2. Such arrangements should result in higher efficiency and uniformity of light output than are obtainable with the simpler arrangement of Figure 1. In Figure 1 much of the radiation is produced underneath the n-contact so that it cannot escape through the n-face of the diode.

**Note:** A related innovation is described in NASA Tech Brief 64-10283, November 1964. Inquiries may also be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama, 35812  
Reference: B65-10006

**Patent status:** NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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under contract to Marshall  
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